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US 4193370	

(58) Field of search
B7V
Selected US specifications from IPC sub-classes B63H B63B

(54) Improved speed boat

(57) A small one-man "fun" hydroplane is powered and steered by an outboard motor 25 working in combination with a pair of aileron-style flaps 22. The flaps 22 are located on the underside of the boat hull 17 at the back of the hull and are disposed one to each opposite side of the hull's longitudinal centre line 12. A foot-operated rudder bar 33 swivels the outboard motor from side to side via cables 34, 35 whilst a single joystick 42 is linked to the flaps 22 by an articulated rod linkage 45 - 53, such that appropriate movements of the joystick 22 can move the flaps 22 simultaneously in respectively opposite up-and-down directions to promote and enhance deliberately the inherent tendency of the boat to bank as it steers into a turn via the motor 25.

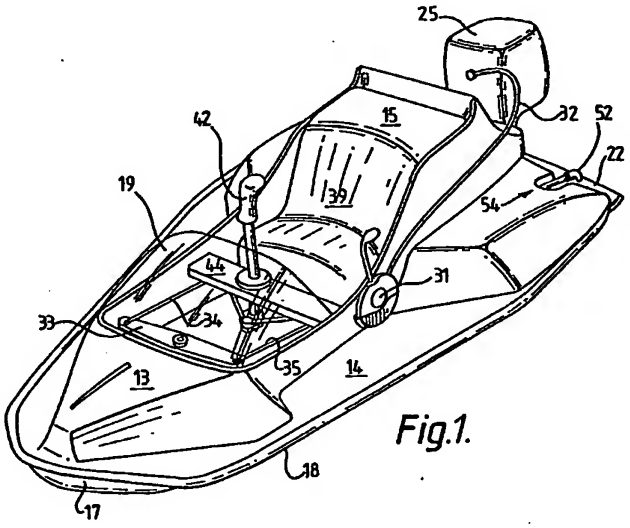


Fig.1.

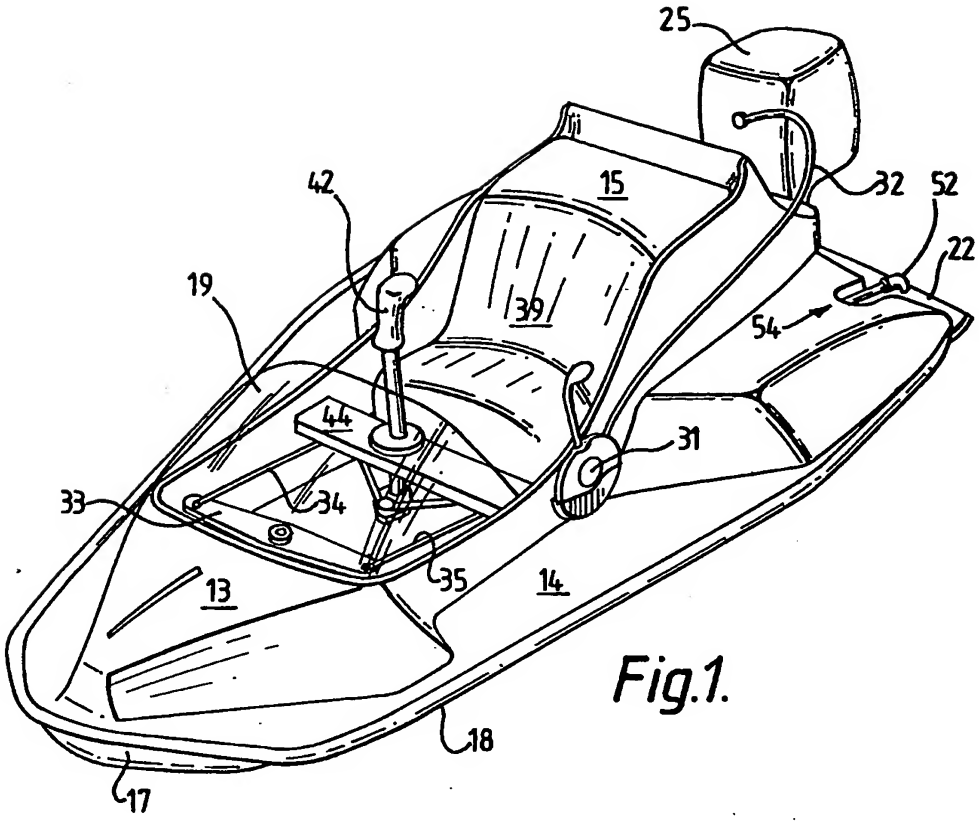
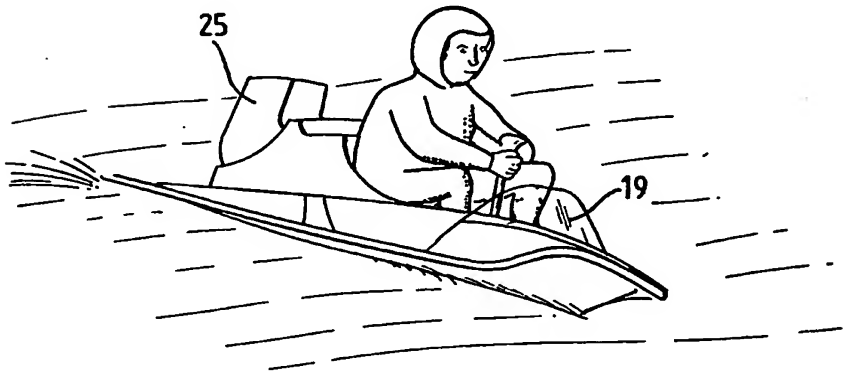


Fig.1.

Fig.6.



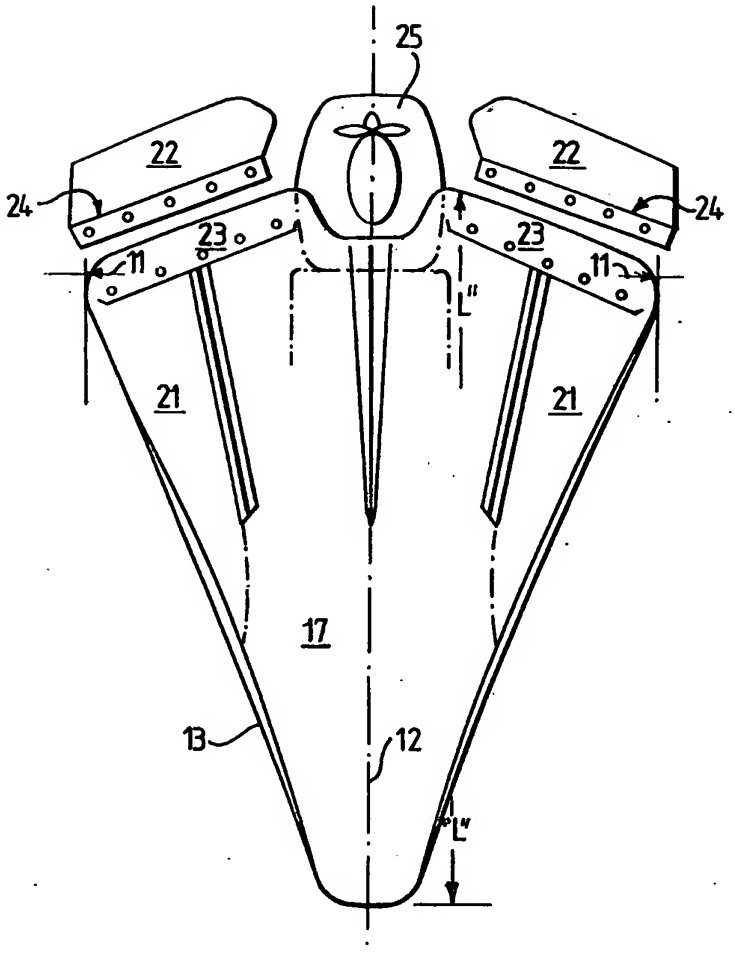


Fig.2.

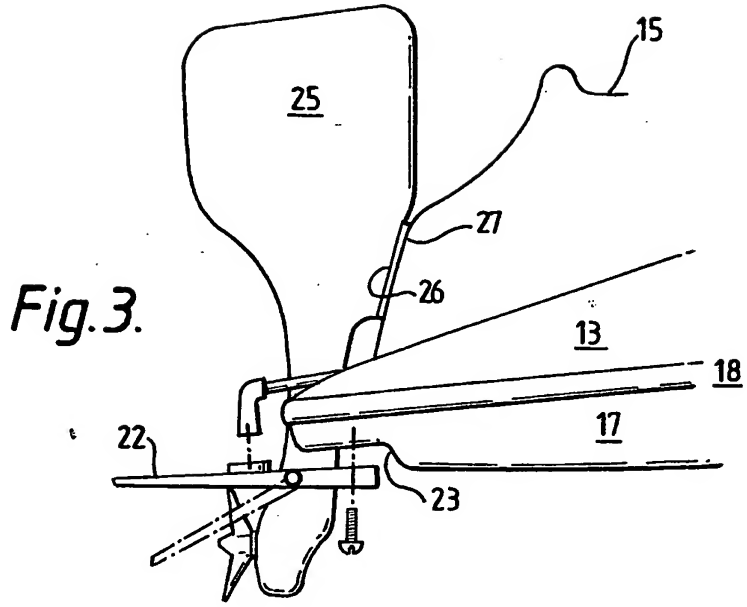


Fig.3.

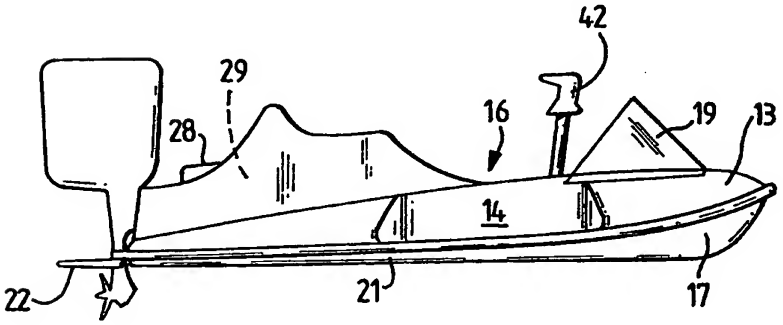


Fig.4.

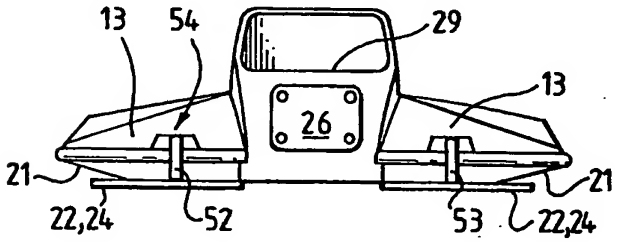


Fig.5.

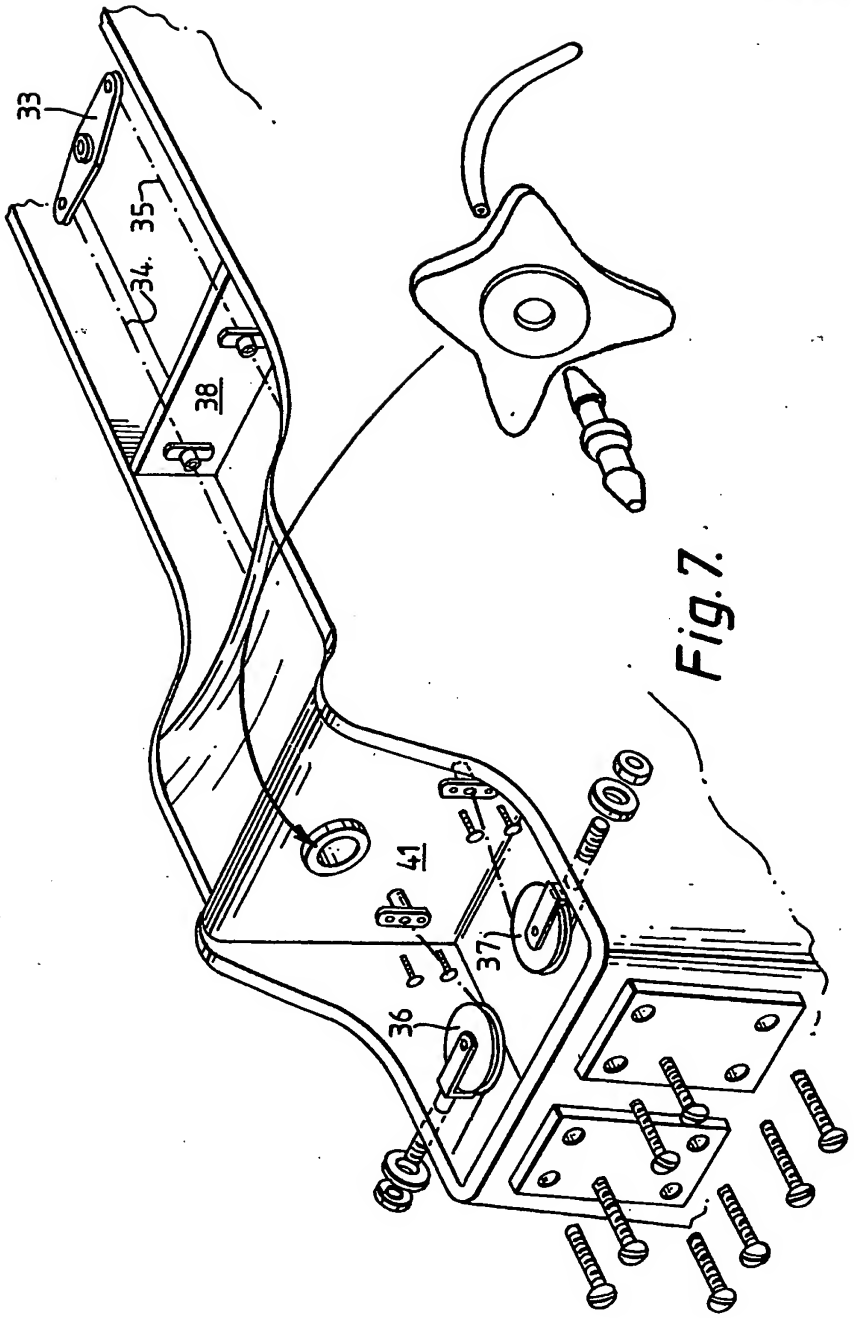


Fig.7.

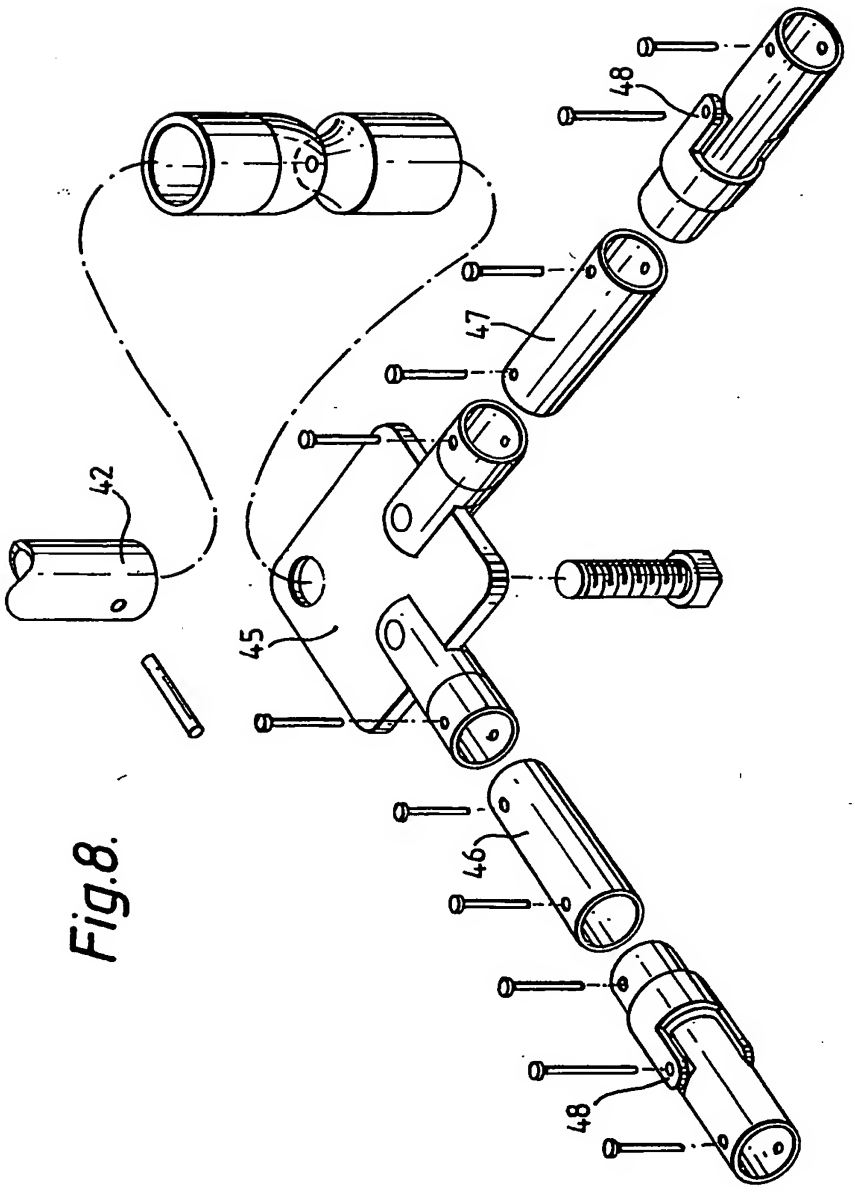


Fig.8.

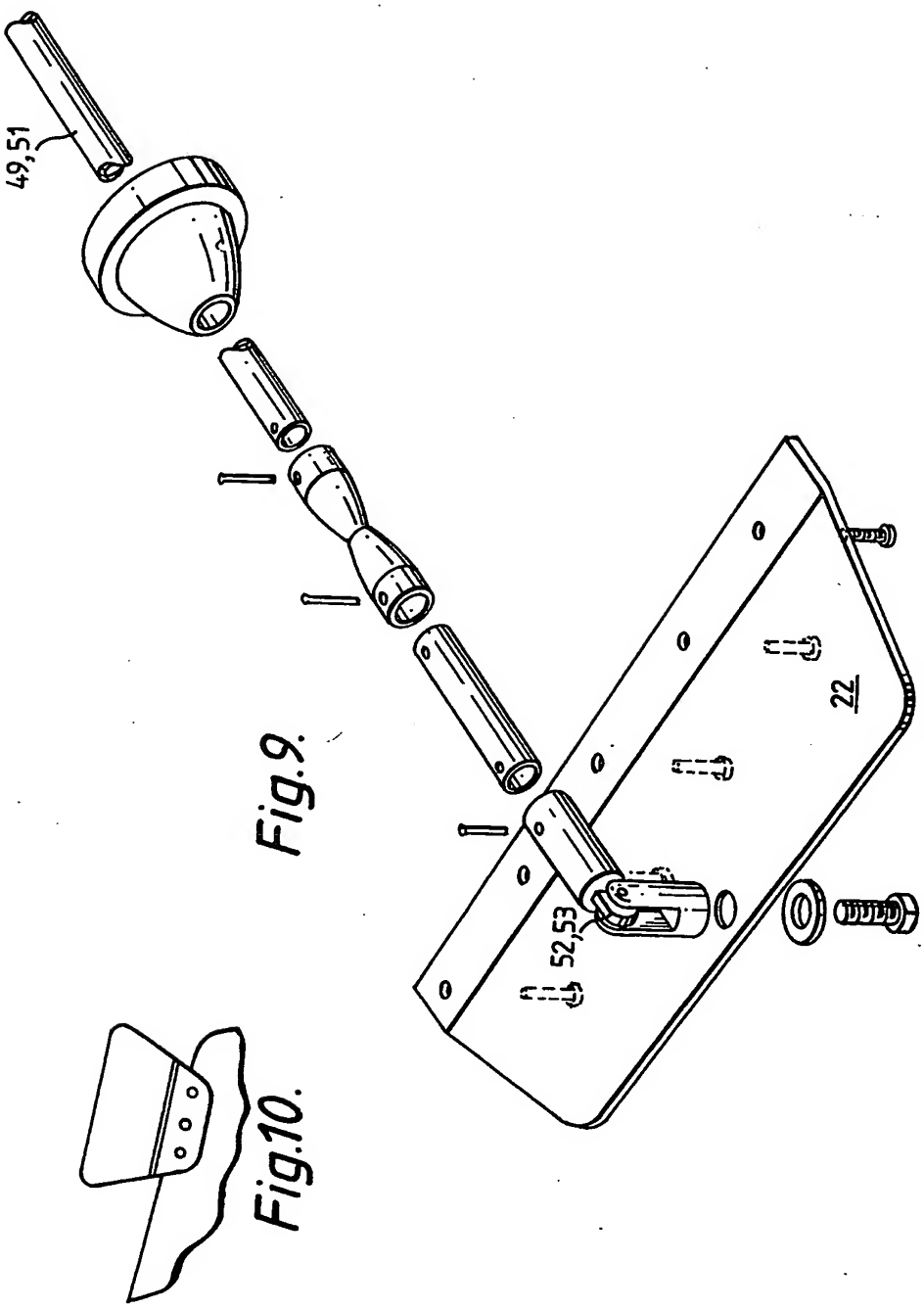


Fig.9.

Fig.10.

SPECIFICATION

Improved speed boat

Field of the invention

The invention relates to speed boats and is applicable with particular advantage to hydroplanes.

A speed boat is a boat designed to travel at high speed with at least the front part of the underside of its hull either out of the water or planing on top of the water. A hydroplane is a kind of speed boat in which substantially all of the underside of the hull planes across the top of the water as the boat travels.

Review of art known to the applicant

A conventional speed boat is steered by a rudder. When such a boat steers into a turn, its speed may cause it to bank (i.e. to lift from the water along one side of its hull and to heel correspondingly towards the water along the other side of its hull) to an extent. Even if it is deliberately banked, however, it will still have a wide turning circle if its forward speed is maintained throughout the turn, because there are practical limits to the extremes of movement allowed to the rudder in such circumstances.

A conventional light aircraft, by contrast, is steered by a combination of a rudder and ailerons which can be operated to produce a deliberately banked turn and so to achieve an altogether more tight turning circle than that of the conventional speed boat as outlined above. There is no readily apparent reason why the teachings of the aeronautical art should be considered when seeking to improve upon the conventional speed boat, and as far as the applicant is aware such a consideration has never previously been proposed.

Summary of the invention

The invention takes as its starting point the conventionally steered speed boat, as outlined above, and is based on the realisation that it is possible to reduce dramatically the turning circle of the boat, without necessarily having to slow the boat down when turning, by applying to the design of the conventional boat the teachings already known *per se* from the aeronautical art.

According to the invention in its broadest aspect, a speed boat, especially a hydroplane, is steered by a rudder or rudders working in combination with a pair of aileron-style flaps, the flaps being located on or adjacent the underside of the boat hull and being disposed one to each opposite side of the hull's longitudinal axis, and with means to control the movement of the flaps such that in use they can be simultaneously moved in respectively opposite directions to promote and enhance deliberately the inherent tendency of the boat to bank as it steers into a turn via its rudder.

The deliberately banked effect experienced by a boat embodying the invention is more readily produced when the boat is a hydroplane, because substantially the whole of the underside of the hull is already planing across the top of the water and it requires only relatively low pressure from one or from both flaps onto the water surface to bank the hull in the desired direction. A small hydroplane, designed primarily for leisure or sporting purposes, can be turned through 180 degrees virtually within its own length when constructed in accordance with the invention.

It is conventional to power small speed boats, and especially hydroplanes, by an outboard motor. These are readily available, their reliability nowadays is proven, and because they tend to constitute a high proportion of the overall boat-plus-power-unit weight, they literally tip the balance of the boat (in the fore-and-aft sense) towards producing the intended planing effect even at relatively modest speeds. They also combine the functions of power unit and rudder. A speed boat embodying the invention could with advantage be powered by such a motor, especially where the boat was intended to comprise a relatively small, cheap and readily constructed 'fun' hydroplane. In certain circumstances, however, it could appropriately be powered by an inboard motor with a separate steering rudder.

Each aileron-style flap could be controlled by its own respective lever by the boat operator. Conveniently such lever controls could be provided one for each of the operator's hands and could accordingly be located one to each opposite side of the boat's longitudinal axis, in or adjacent the operator cockpit or other operator station. Preferably, however, a single aircraft-style 'joystick' controls the movement of both flaps, and preferably again such a joystick is mounted centrally of the operator station. Although the operator will still have to think about co-ordinating the movements of the two flaps to produce the effect he desires in order to perform any given manoeuvre, it is well proven from the aeronautical field that an operator of average skill adapts readily to the use of a single centrally-mounted joystick. Also, where the boat comprises a small hydroplane in relation to which the operator is both heavy and bulky, a single centrally mounted joystick is advantageous in that the operator's movements of the joystick (and hence of his own body mass) will tend to be symmetrical about the longitudinal centre line of the boat. The balance and overall 'feel' of such a boat are then optimised.

Where a single joystick controls the movements of both flaps, the flaps are preferably linked to the joystick by respective linkages comprising inherently rigid rods articulated to one another. An articulated-rod linkage, unlike a cable, will transmit pushing as well as pulling movements of the joystick to the flap, and lends itself readily to being housed inside the boat hull and hence protected from the adverse effects of spray and water generally. Such protection enables the advantageous articulated joints to be incorporated into the linkage without undue fear of their seizing up during or after prolonged use.

The rudder of a conventional speed boat is controlled by a steering wheel, moving the rudder through a cable linkage, or by a tiller. In a boat

embodying the invention, preferably the rudder is controlled instead by a foot-operated rudder bar. Such bars are once again known *per se* from the field of light aircraft construction, and are used in combination with an aileron-moving joystick. The feasibility of using them is thus generally already proven, and when applied to the field of speed boats (especially small 'fun' hydroplanes) they enable the operator to steer and bank his craft without his own movements upsetting in themselves the important and delicate balance and 'feel' of the boat.

Preferably the overall shape of the hull of the boat is such that the underside meets the deck with substantially no defined sides between the two. Because the boat will be deliberately banked in use, and may well be banked at angles which are excessive by comparison with conventional craft, there would be a danger of the boat being pulled over onto its side if the conventional defined side were present.

Preferably the underside of the hull exhibits two defined surfaces, disposed one to each opposite side of the longitudinal centre line of the hull, and each so sized and shaped as to constitute an auxiliary surface, distinct from the major portion of the underside of the hull, on which the boat can plane during a banked turn. This again aids the stability of the boat when it is being used to maximum effect. Preferably also, in such a case, these surfaces are located towards the back of the hull because the most probable weight distribution fore-and-aft will cause the boat to tend to lean back as it banks.

When viewed in plan, the boat hull may with advantage be generally triangular with the base of the notional triangle measuring approximately not less than two thirds the length of the hull, and with the notional base spanning the back rather than the front of the hull. Such a shape is inherently stable when banked, in comparison with the more traditional and conventional elongate speed boat hull plan.

Preferably also the cockpit or other operator station, and the controls of the boat, are so located on the hull that in use the operator sits in a feet-forwards position with his weight taken primarily on his rear and with his legs sufficiently far in front of him that, in practical terms, it is impossible for him to rise from his sitting position by using the thrust of his legs alone. Here again, especially where the boat comprises a small hydroplane, it is important to optimise the balance of the boat by keeping the centre of gravity of the operator's body as low as possible. A feet-forward sitting position also makes it easiest for him to operate controls such as a central joystick and foot-moved rudder bar where these are provided.

Where the boat comprises, as has previously been touched on, a small hydroplane intended primarily for leisure and sporting purposes, the flaps need not necessarily span substantially the full width or even a major portion of the width of the underside of the hull. It may well be possible for each flap to be a relatively small flap, and indeed it has been found in non-public trials that each flap may be generally triangular, rather than rectangular, preferably so mounted on the hull that the base, not the apex, of the triangular flap trails the hull as the boat travels forward. In such a case, the 'footprint' of the flap on the surface of the water will be very small and yet the flap movement will produce the desired banking effect on the hull. Such flaps, operating in such a way, will bear and will transmit less stress than the larger and generally rectangular flap which would have been expected as a result of conventional thinking.

Brief description of the drawings

The accompanying drawings show one speed boat embodying the invention. It is only an example of forms which the invention might take within its broadest aspect, but it is currently the best way known to the applicant of putting the invention into practice. In these drawings:

Figure 1 shows the boat in perspective;

Figures 2 and *3* show, respectively, an 'exploded' view of the underside of the boat hull, and a similarly 'exploded' side view of the back portion of the boat, in each case illustrating how the aileron-style flaps are positioned and located on the underside of the boat hull;

Figures 4 and *5* show the boat, respectively, in side view with its outboard motor fitted, and viewed end-on from the back with its outboard motor not fitted for clarity;

Figure 6 is again a perspective view showing the boat executing a banked left-hand turn and illustrating the sitting position of the operator in use;

Figure 7 is a schematic perspective view showing the way the foot-moved rudder bar steers the boat via a cable linkage;

Figures 8 and *9* are similarly drawn schematic perspective views showing the way in which a single joystick operates the boat's aileron-style flaps via an articulated-rod linkage;

Figure 10 is a schematic plan view showing an alternative form of aileron-style flap, with a pair of which the boat could be fitted.

Figures 1, 2 and 3 are all drawn to approximately the same scale. Figures 4, 5 and 6 are again all drawn approximately to the same scale as one another but to a smaller scale than Figures 1, 2 and 3. Figures 7, 8 and 9 are drawn to the same scale as one another but to an enlarged scale when compared with any of the other Figures of the drawings. Figure 10 is drawn approximately to the same scale as Figures 1, 2 and 3.

Description of the preferred embodiment

The boat illustrated is a small hydroplane intended primarily for leisure and sporting purposes and constitutes a craft of the kind known colloquially as a 'fun' craft. When viewed in plan, e.g. in underplan as in Figure 2, the boat hull is generally triangular with the base 11 of the notional triangle measuring between one half and three quarters (in this particular embodiment, approximately two thirds) the length of the hull when that length is measured along the longitudinal centre line 12 of the hull; and with the notional base 11 spanning

the back rather than the front of the hull.

The deck 14 of the boat is recessed, as indicated at 14 in Figure 4, along each of its opposite longitudinal sides to provide respective footwells for a passenger who can sit on a platform 15 defined behind the cockpit 16 in which the main operator of the boat sits in use. The deck 13 meets the underside 17 of the boat along a line 18. There is essentially no defined hull side between the deck 13 and the underside 17 of the boat.

The deck 13 and hull 17 of the boat are each initially manufactured as respectively separate pieces from glassfibre reinforced plastics and are subsequently joined along their common periphery 18 to define a hollow open-cockpit shell. The line of join 18 is masked in practical embodiments by a rubber strip which covers the join between the deck 13 and the hull 17 and which can also act in use as a fender.

A transparent plastics screen 19 rises from the deck 13 in front of the cockpit 16 and acts in use as a spray shield for the operator.

The underside of the hull 17 is designed to plane across the top of the water when the boat is driven forward at high speed. It thus defines, in cross section across the boat, only a very shallow wide-angle V which progressively and rapidly flattens towards the back of the boat. It exhibits, however, two defined surfaces 21, disposed one to each opposite side of the longitudinal centre line 12 of the hull, and each so sized and shaped as to constitute an auxiliary surface on which the boat can plane during a banked turn. As Figure 2 shows, each of these auxiliary surfaces 21 is substantially triangular when the boat is viewed in underplan, and each broadens towards the back of the boat hull.

In this particular boat, the surfaces 21 are substantially flat. As Figure 5 shows, they are angled upwardly from the major portion of the underside 17 of the hull, and as Figure 2 shows they are located towards the back of the hull.

A pair of aileron-style flaps 22 is initially formed as two flaps each separate from the underside 17 of the boat hull and each such flap is subsequently screwed, as Figures 2 and 3 show, to fit into a respective recess 23 formed in the underside 17 of the boat hull at the back of the boat. When positioned in their recesses, the flaps 22 are located one to each opposite side of the hull's longitudinal centre line 12. As Figures 2 and 3 show respectively, the flaps 22 form a wide-angle V when the boat is viewed in underplan but are substantially horizontal and (Figure 5) in line with one another when the boat is viewed from the side or from the back in its normally intended floating position.

The flaps 22 pivot about respective hinges 24 to steer the boat in combination with the side-to-side swivelling movements of a proprietary outboard motor 25 mounted conventionally at the back of the boat on the longitudinal centre line 12 of the boat hull. The motor 25 is fixed securely to a thrust plate 26 which is itself fixed to a substantially upright transom 27 defined behind the platform 15 to the rear of the operator cockpit 16. In effect, as Figure 2 shows particularly, the motor 25 hangs from the back of the boat in a manner which can generally be described as conventional. A fuel tank 28 can be mounted in a well 29 defined between the transom 27 and the raised back edge of the platform 15, or it may be mounted below the platform 15 and in front of the back wall of that platform so as to be encased by rather than exposed amid the raised rear portions of the deck 13.

The outboard motor 25 can relatively easily be removed from the boat, in conventional manner. Its throttle controls, as Figure 1 shows, are mounted at 31 at one side of the operator cockpit 16 and are linked to the motor by a conventional cable control 32.

The side-to-side swivelling steering movements of the motor 25 are initiated by a foot-operated rudder bar 33 which is mounted in the well of the cockpit 16 beneath the spray shield 19 and which pivots, in use, about an axis which is substantially vertical when the boat is in its normally intended floating attitude. Respective cables 34, 35 run from each opposite end of the bar 33 along the length of the boat and around pulleys 36, 37 to be secured to the casing of the motor 25. The cables 34, 35 are maintained in a normally substantially taut state so that pivotal movements of the bar 33 in either sense transmit a pull to a respective one of the cables to swivel the motor 25 about its mounting.

As Figure 7 shows, the cables 34, 35 run along the well of the cockpit 16 and then enter the covered unexposed inside of the boat deck and hull 38. The transom 38 defines simultaneously the back of the cockpit well and the front of the squab of the operator's seat 39. The back of the seat 39 rises to meet the platform 15, and this platform, together with the seat back and seat squab, is suitably padded.

The cables 34, 35 emerges from their run beneath the operator's seat 39 and the platform 15 via holes in the wall 41 which defines the front of the well 29 previously referred to. They then run each side of the fuel tank 28 and around the pulleys 36, 37 to the motor casing 25.

The aileron-style flaps 22 are linked to a single aircraft-style joystick 42 which is mounted in the operator's cockpit 16 on the longitudinal centre line 12 of the boat. The joystick 42 has a universal movement about its pivot 43 and is fixed to a bearer 44 which spans the cockpit 16. The stick 42 passes through the pivot 43 and emerges beneath the bearer 44 to end in a plate 45 (Figure 8). Respective rods 46, 47 run from this plate 45 towards each opposite side of the cockpit 16 and are linked, by joints 48, to twin rigid rods 49, 51 which run along the length of the hull and which are themselves linked by further joints 52, 53 to respective ones of the flaps 22.

The rods 49, 51 are each essentially rigid rods. Like the cables 34, 35, they run through the transom 38 and are then encased by the shell of the boat until they emerge, as indicated at 54 in Figure 1, from the back of the deck of the boat just above their respective flaps 22. The joints 48 are to some extent shrouded and protected from spray by the sides of the cockpit 16 and, in use (see Figure 6),

by the operator's legs. The joints 52, 53 are similarly shrouded by the form of the surrounding deck shell, as Figure 1 shows, but if necessary the deck shell could be so formed as to encase the joints 52, 53 and the cockpit well could similarly be so formed as to shroud the joints 48.

Movements of the joystick 42 about its pivot 43 will push and pull the rods 49, 51 to move the flaps 22 simultaneously up (i.e. to the position illustrated in full line in Figure 3) or simultaneously down (to the position illustrated in its extreme in broken line in Figure 3) or simultaneously one up and one down. The latter movement, in conjunction with the swivelling steering movements of the motor 25 initiated by the rudder bar 33, will promote the spectacular banked turns previously referred to.

As Figure 6 illustrates, the cockpit 16 and the hand-operated and foot-operated controls respectively 42, 33 of the boat are so located relative to one another on the hull that in use, the operator sits in a feet-forwards position with his weight taken primarily on his rear in the seat 39. The opposite longitudinal sides of the cockpit 16, as they flare up towards the platform 15 at the back of the cockpit, support the operator's body laterally when the boat is moving at speed. The forward portions of these cockpit sides, as illustrated, are relatively vestigial so as not to impede the movements of the operator's legs on the rudder bar 33.

In Figure 10, the flap 22 is relatively much smaller than the generally rectangular flaps 22 illustrated elsewhere in the drawings. It is generally triangular when viewed as in Figure 10, and is mounted on the underside of the hull 17 so as to pivot approximately about its apex and so that its base, not its apex, trails the hull as the boat travels forward.

CLAIMS

1. A speed boat, especially a hydroplane, steered by a rudder or rudders working in combination with a pair of aileron style flaps, the flaps being located on or adjacent the underside of the boat hull and being disposed one to each opposite side of the hull's longitudinal axis, and with means to control the movement of the flaps such that in use they can be simultaneously moved in respectively opposite directions to promote and enhance deliberately the inherent tendency of the boat to bank as it steers into a turn via its rudder.

2. A speed boat according to Claim 1 which is powered by an outboard motor.

3. A speed boat according to Claim 1 or 2 in which a single aircraft style joystick controls the movement of both flaps.

4. A speed boat according to Claim 3 in which the joystick is mounted centrally of the operator station.

5. A speed boat according to Claim 3 or 4 in which the flaps are linked to the joystick by respective linkages comprising inherently rigid rods articulated to one another.

6. A speed boat according to any one of the preceding Claims in which the or each rudder is controlled by a foot operated rudder bar.

7. A speed boat according to any one of the preceding Claims in which the shape of the hull of the boat is such that the underside meets the deck with substantially no defined sides between the two.

8. A speed boat according to Claim 7 in which the underside of the hull exhibits two defined surfaces disposed one to each opposite side of the longitudinal centre line of the hull and each so sized and shaped as to constitute an auxiliary surface, distinct from the major portion of the underside of the hull on which the boat can plane during a banked turn.

9. A speed boat according to Claim 8 in which the surfaces are located towards the back of the hull.

10. A speed boat according to any one of the preceding Claims in which the boat hull, when viewed in plan, is generally triangular with the base of the notional triangle measuring approximately not less than two-thirds the length of the hull and with the notional base spanning the back of the hull.

11. A speed boat according to any one of the preceding Claims in which the cockpit or other operator station and the controls of the boat are so located on the hull that in use the operator sits in a feet-forwards position.

12. A speed boat according to any one of the preceding Claims in which each flap is generally triangular and mounted on the hull, such that the base of the triangular flap trails the hull as the boat travels forward.

13. A speed boat, especially a hydroplane steered by an outboard motor working in combination with a pair of aileron style flaps, the flaps being located on or adjacent the underside of the boat hull and being disposed one to each opposite side of the hull's longitudinal axis, a foot operated rudder bar controlling the outboard motor and a single joystick controlling the movement of the flaps, the joystick being linked to the flaps by respective linkages comprising inherently rigid rods articulated to one another, the joystick controlling the movement of the flaps, such that in use they can be simultaneously moved in respectively opposite directions to promote and enhance deliberately the inherent tendency of the boat to bank as it steers into a turn via its rudder.

14. A hydroplane arranged substantially as herein described with reference to and as illustrated in Figures 1 to 9 of the accompanying drawings.

15. A hydroplane arranged substantially as described with reference to and as illustrated in Figures 1 to 9 when modified in accordance with Figure 10 of the accompanying drawings.

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